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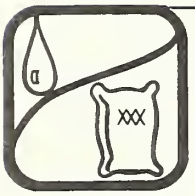
U.S. EDIBLE FATS AND OILS REFINING CAPACITIES, 1975



REPRINTED FROM THE FATS AND OILS SITUATION • FOS-281, FEBRUARY 1976

by George W. Kromer and
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ECONOMIC RESEARCH SERVICE

U.S. DEPARTMENT OF AGRICULTURE

U.S. EDIBLE FATS AND OILS REFINING CAPACITIES, 1975

by

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ABSTRACT: A special USDA survey of U.S. edible fats and oils refiners shows that the industry's maximum annual refining capacity at the end of 1975 totaled 17.0 billion pounds (7.7 million metric tons). Another 1.3 billion pounds of capacity was under construction and was scheduled for completion during 1976 and 1977, boosting potential refining capacity to 18.3 billion pounds (8.3 million metric tons). The industry's capacity has expanded about a third since 1967, the last special USDA survey. For the year ending September 1974, the industry operated at about 60 percent of capacity for refining and production of refinery products such as shortening, salad and cooking oils, and margarine oil. The industry's packing rate was about half of its estimated maximum capacity. In 1975 there were 49 companies operating 97 edible fats and oil refineries in the United States. All participated in the USDA survey.

KEYWORDS: Edible fats and oils refineries, refining capacity, fats and oils production and packing capacities.

Highlights of 1975 Survey

In mid-1975 the USDA conducted a mail survey requesting information on capacities and output from all known U.S. refiners of edible fats and oils. Data received, representing 100 percent of the industry's capacity, revealed these major highlights:

(1) Maximum annual refining capacity continues to expand. As of December 31, 1975, it totaled 17.0 billion pounds.[1] This represents an increase of about a third from the 12.7 billion-pound-capacity reported in the 1967 USDA special survey (FOS-244, September 1968). Another 1.3 billion pounds of capacity was under construction and was scheduled for completion during 1976 and 1977, boosting potential refining capacity to 18.3 billion pounds (table 14).

(2) The industry's optimum practical capacity for refining and further processing (bleaching, hydrogenation, winterizing, deodorizing) averages about 85 percent of maximum capacity.

(3) The total number of companies (49) and refineries (97) operating in 1975 was greater than in 1967, and the average size of plants has increased more than a tenth. In the case of alkali refining capacity, the 14 largest plants (350-750 million pounds maximum capacity) accounted for nearly one-half of total U.S. refining and further processing capacities for edible fats and oils.

(4) The industry operated at about 60 percent of its estimated maximum annual capacity for refining (over 70 percent of optimum practical) as well as for production of refinery products during the year ending September 1974. The utilization rates for bleaching, hydrogenation, and deodorization averaged about two-thirds of maximum capacity, whereas winterization averaged three-fourths. The refineries' packing rate was about half of their estimated maximum capacity.

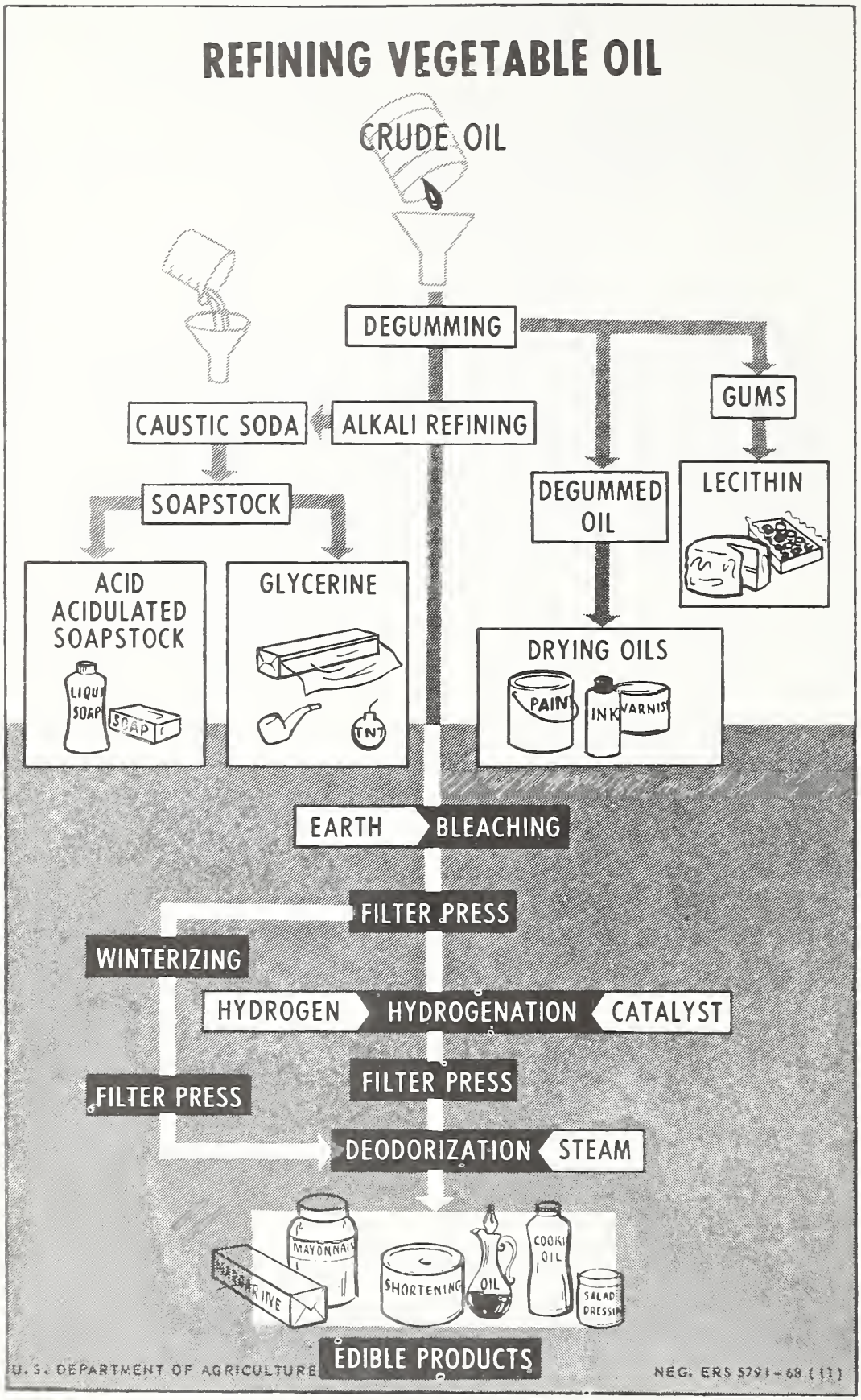
(5) Most refiners produced finished products. The total pack of edible fats and oils during 1973/74 was 11.5 billion pounds, about 9.3 billion pounds or 80 percent of which were liquids. Three-fourths of the liquid pack was shipped in bulk. For the solid pack, about half was in consumer-sized 1- to 3-pound containers, and over 40 percent was in 50- to 60-pound tins or cubes.

[1]Maximum annual capacity estimates throughout this report are as of December 31, 1975, and are based on the October 1973-September 1974 product mix and the assumption that the plant operates a 52-week year, a 7-day week, and a 24-hour day. Optimum practical capacity is based on normal or average shutdown time for repairs, replacements, cleaning, etc.

TABLE 14.--U.S. EDIBLE FATS AND OILS REFINING CAPACITIES, 1975, AND UNDER CONSTRUCTION FOR COMPLETION IN 1976 AND 1977 1/

ITEM	PRODUCTION CAPACITY			PRODUCTION (OCT. 1973 - SEPT. 1974)	
	1975 (END OF YEAR) 2/		UNDER CONSTRUCTION 3/	TOTAL	PROPORTION OF MAXIMUM CAPACITY
	MAXIMUM	OPTIMUM PRACTICAL			
	MILLION POUNDS				PERCENT
REFINING:					
ALKALI	16,325	13,831	4/	9,894	61
STEAM	381	339	4/	204	54
MISCELLA	330	314	---	182	55
TOTAL	17,036	14,484	1,310	10,280	60
FURTHER PROCESSING:					
BLEACHING	15,575	13,240	1,227	9,619	62
REARRANGEMENT	606	485	---	183	30
HYDROGENATION	8,651	7,384	636	5,638	65
WINTERIZING	2,313	1,950	377	1,769	76
DEODORIZING	14,553	12,632	1,477	9,322	64
PLASTICIZING	5,947	3,790	4/	2,087	35
OTHER	376	110	---	68	18
REFINERY PRODUCTS:					
SALAD AND COOKING OILS	6,328	5,455	358	4,093	65
BAKING & FRYING FATS	5,841	4,953	612	3,618	62
MARGARINE OIL	3,228	2,689	4/	1,864	58
SOAP STOCKS/FOOTS	660	557	21	458	69
NONFOOD INDUSTRIAL	111	86	4/	22	20
OTHER	741	713	4/	438	59
TOTAL	16,909	14,453	1,358	10,493	62
PACKING:					
LIQUID SHORTENING--					
DRUM	---	374		52	
5-GAL. CONTAINER	---	764		419	
10-QT. CONTAINER	---	67		44	
1-GAL. CONTAINER	---	796		323	
5-QT. CONTAINER	---	164		130	
OTHER	---	495		274	
OTHER LIQUID OIL	---	990		760	
TOTAL LIQUIDS	---	3,650	5/	2,002	6/55
SOLIDS AT ROOM TEMPERATURE--					
350-450 LB. DRUM	---	566		59	
110-120 LB. CONTAINER	---	625		79	
50-60 LB. TINS OR CUBES	---	2,122		955	
1-3 LB. CONTAINER	---	1,832		1,041	
OTHER	---	206		96	
TOTAL SOLIDS	---	5,351	5/	2,230	6/42
BULK SHIPMENTS	---	7/7,291		7,291	
TOTAL LIQUIDS AND SOLIDS	8/	16,292		11,523	6/71

1/ DATA COMPILED FROM SPECIAL USDA SURVEY CONDUCTED IN MID-1975. 2/ INCLUDES ALL REPORTED EXPANSIONS THROUGH DECEMBER 1975. 3/ FOR COMPELTION IN 1976 AND 1977. 4/ WITHHELD TO AVOID DISCLOSURE OF INDIVIDUAL COMPANY'S OPERATIONS. 5/ NONE REPORTED. 6/ PROPORTION OF OPTIMUM PRACTICAL CAPACITY. 7/ REFINERS WERE NOT ASKED TO REPORT BULK CAPACITY. THIS FIGURES IS BASED ON 1973/74 BULK SHIPMENTS, AS THEY HAD AT LEAST THIS MUCH CAPACITY. 8/ NOT INCLUDED IN SURVEY.


REFINING VEGETABLE OIL
CRUDE OIL
DEGUMMING
GUMS
CAUSTIC SODA
ALKALI REFINING
LECITHIN
SOAPSTOCK
DEGUMMED OIL
ACID ACIDULATED SOAPSTOCK
GLYCERINE
DRYING OILS
EARTH
BLEACHING
FILTER PRESS
WINTERIZING
HYDROGEN
HYDROGENATION
CATALYST
FILTER PRESS
FILTER PRESS
DEODORIZATION
STEAM
EDIBLE PRODUCTS
U.S. DEPARTMENT OF AGRICULTURE
NEG. ERS 5791-68 (11)

(6) Maximum bulk edible fats and oils loading capacity per day at refining plants totals an estimated 100 million pounds, 70 percent of which is for fully refined and deodorized commodities. The capacity for bulk storage of edible fats and oils at the plant exceeds 2 billion pounds.

The Survey

During the summer of 1975 the USDA conducted a mail survey of all known U.S. refiners of edible fats and oils. At the time of the survey, there were 49 companies with 97 refineries in operation. Pertinent data were obtained on refining facilities, intermediate processing, refinery products, and packing output and capacities as well as on new capacity under construction. The last USDA survey on industry capacity was made in 1967.

Most plants in the survey alkali refine edible vegetable oils, and most manufacture products such as baking and frying fats (shortening), salad and cooking oils, and margarine. The survey also included steam refiners of lard and edible tallow and miscella refiners of cottonseed oil. Palm oil steam-refining data are included with alkali refining.

The survey information summarized here accounts for 100 percent of both the U.S. refining and packaging capacity and of the actual volume of production and packaging of edible fats and oils. Survey data on total production of finished products are within 1 percent of published Census statistics. The data are summarized and shown in such a way that the operations of individual companies are not disclosed.

The Institute of Shortening and Edible Oils, Inc., cooperated with USDA in the conduct of the survey.

Refining Process

The U.S. refining industry encompasses those plants which conduct one or more of the continuous processing operations used to refine crude fats and oils for food use. Refining removes any undesirable elements such as non-fatty materials termed "gums," (primarily phosphatides), color bodies or pigments, and free fatty acids. The clear yellow oil remaining may be further processed by bleaching, hydrogenation, winterization, or deodorization, depending upon the type of fat or oil processed and its ultimate use.

Refining purifies crude oil by combining it with an alkali (usually caustic soda) or by some other chemical or steam operation. The removed impurities are known as soapstock, an important ingredient used to make soap and glycerine. Miscella refining is the process applied to crude cottonseed oil.

A Fifth of Refineries Account For Nearly Half of U.S. Capacity

In the United States, the alkali refining process for edible fats and oils is the most common. Sixty-seven refineries reported maximum alkali refining capacity of 16.3 billion pounds as of the end of 1975, about 96 percent of total capacity. Steam refineries (17 plants) accounted for 0.4 billion pounds and miscella refineries (6) accounted for 0.3 billion pounds.

Refineries employing the alkali refining process were arrayed by plant size in terms of maximum annual capacity. The 14 largest refineries (350-750 million pounds) accounted for 41 percent of total alkali refining capacity, or 6.6 of 16.3 billion pounds. They also accounted for nearly half of the capacities for further processed edible oils and for 37 percent of the refinery products. A profile of these refineries is presented in table 15.

The second largest group of refineries (19 plants having maximum capacities of 250-325 million pounds) has an alkali refining capacity of 5.3 billion pounds or 32 percent of the U.S. total. This group accounted for over 30 percent of capacity for further processing and 35 percent for manufacturing refinery products.

The third group (17 plants having capacities of 125-250 million pounds) with maximum alkali refining capacity of 3.2 billion pounds accounted for a fifth of all capacities.

The smaller edible oil refineries (17 plants having 25-125 million pounds capacity) accounted for 8 percent or less of the industry capacities for alkali refining, further processing, and refinery product manufacturing.

Capacity Expansion Underway

Twenty refineries reported planned expansion in capacities for refining, intermediate processing, and manufacturing food fat products. This new capacity under construction is at existing plants and is scheduled to be in operation before the end of 1977. No completely new alkali refining plants were reported under construction.

Five plants are increasing refining capacity (alkali and steam) a total of 8 percent or 1.3 billion pounds, pushing total U.S. capacity for edible fats and oils to 18.3 billion pounds when completed.

Expansion is also underway in the major intermediate processing stages for edible fats and oils. Bleaching capacity at five plants is expected to expand 8 percent or 1.2 billion pounds, with the U.S. total reaching 16.8 billion by end of 1977. Hydrogenation expansions at six plants of 0.6 billion pounds will boost total U.S. capacity to 9.3 billion. Five refineries are expanding winterizing facilities by 0.4 billion pounds, boosting the

TABLE 15.--PROFILE OF U.S. EDIBLE FATS AND OILS REFINING INDUSTRY: PLANTS GROUPED BY MAXIMUM ALKALI REFINING CAPACITY, 1975 1/

PLANT SIZE 2/	REFINERIES REPORTING	TOTAL ALKALI REFINING CAPACITY	FURTHER PROCESSING					REFINERY PRODUCTS					
			BLEACHING	HYDROGENATION	WINTERIZING	DEODORIZING	PLASTICIZING	SALAD AND COOKING OILS	BAKING AND FRYING FATS	MARGARINE OIL	SOAP STOCK FOOTS	OTHER	TOTAL
MIL. LB.	NO.	-MIL. LB.-											
350-750	14	6,644	6,186	3,857	991	5,716	2,310	1,879	2,077	1,411	197	287	5,851
250-325	19	5,276	4,609	2,511	853	4,529	1,547	2,791	1,362	982	200	274	5,609
125-250	17	3,150	3,067	1,808	298	2,933	1,360	806	1,523	707	218	76	3,330
25-125	17	1,255	854	274	---	568	3/	534	280	3/	31	3/	1,035
U.S. TOTAL	67	16,325	14,716	8,450	2,142	13,746	3/	6,010	5,242	3/	646	3/	15,825
	PERCENTAGE DISTRIBUTION												
	-PERCENT-												
350-750	21	41	42	46	46	42	3/	31	40	3/	30	3/	37
250-325	29	32	31	30	40	33	3/	46	26	3/	31	3/	35
125-250	25	19	21	21	14	21	3/	14	29	3/	34	3/	21
25-125	25	8	6	3	---	4	3/	9	5	3/	5	3/	7
U.S. TOTAL	100	100	100	100	100	100	100	100	100	100	100	100	100

1/ DATA COMPILED FROM SPECIAL USDA SURVEY CONDUCTED IN MID-1975.

2/ BASED ON ANNUAL MAXIMUM ALKALI REFINING CAPACITY FOR EACH REFINERY.

3/ WITHHELD TO AVOID DISCLOSURE OF INDIVIDUAL COMPANIES' OPERATIONS.

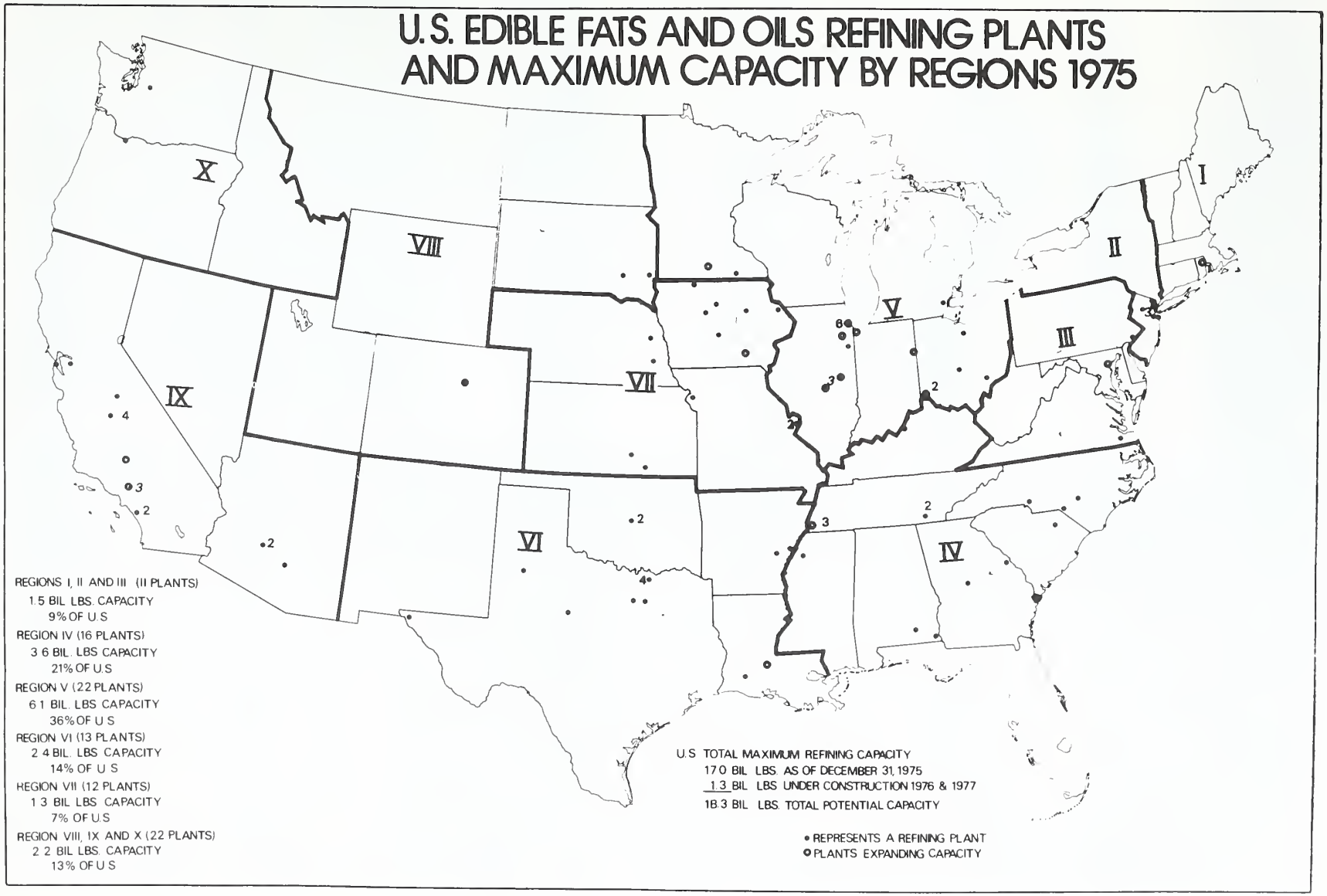

U.S. EDIBLE FATS AND OILS REFINING PLANTS AND MAXIMUM CAPACITY BY REGIONS 1975
X
VIII
IX
VII
VI
V
IV
III
II
I
REGIONS I, II AND III (11 PLANTS)
1.5 BIL. LBS. CAPACITY
9% OF U.S.
REGION IV (16 PLANTS)
3.6 BIL. LBS. CAPACITY
21% OF U.S.
REGION V (22 PLANTS)
6.1 BIL. LBS. CAPACITY
36% OF U.S.
REGION VI (13 PLANTS)
2.4 BIL. LBS. CAPACITY
14% OF U.S.
REGION VII (12 PLANTS)
1.3 BIL. LBS. CAPACITY
7% OF U.S.
REGION VIII, IX AND X (22 PLANTS)
2.2 BIL. LBS. CAPACITY
13% OF U.S.
U.S. TOTAL MAXIMUM REFINING CAPACITY
17.0 BIL. LBS. AS OF DECEMBER 31, 1975
1.3 BIL. LBS. UNDER CONSTRUCTION 1976 & 1977
18.3 BIL. LBS. TOTAL POTENTIAL CAPACITY
• REPRESENTS A REFINING PLANT
O PLANTS EXPANDING CAPACITY

Table 16.--U.S. MAXIMUM ANNUAL PRODUCTION CAPACITY FOR REFINED EDIBLE FATS AND OILS, BY REGIONS, AS OF DECEMBER 31, 1975 1/

REGION	REFINERIES REPORTING	REFINING: ALKALI	REFINING: STEAM	REFINING: MISCELLA	REFINING: TOTAL	FURTHER PROCESSING: BLEACHING	FURTHER PROCESSING: REARRANGEMENT	FURTHER PROCESSING: HYDROGENATION	FURTHER PROCESSING: FRACTIONATION WINTERIZING	FURTHER PROCESSING: FAT OTHER	FURTHER PROCESSING: DEODORIZING	FURTHER PROCESSING: PLASTICIZING	FURTHER PROCESSING: OTHER	REFINERY PRODUCTS: SALAD AND COOKING OILS	REFINERY PRODUCTS: BAKING AND FRYING FATS	REFINERY PRODUCTS: MARGARINE OIL	REFINERY PRODUCTS: SOAP STOCK	REFINERY PRODUCTS: NONFOOTS	REFINERY PRODUCTS: FOOD INDUSTRIAL	REFINERY PRODUCTS: OTHER	REFINERY PRODUCTS: TOTAL
	NUMBERS	MILLION POUNDS																			
REGIONS 1, 2, 3: NJ,NY,RI,PA,MD,VA	11	2/	2/	---	1,522	1,573	147	769	2/	---	1,676	1,011	2/	710	738	2/	60	2/	2/	1,916
REGION 4: AL,GA,KY,MS,NC,SC,TN	16	2/	---	2/	3,628	3,439	2/	1,927	434	2/	3,129	1,049	---	1,521	958	542	204	2/	2/	3,259
REGION 5: IL,IN,MI,MN,OH	22	2/	2/	---	6,126	5,702	250	3,433	862	2/	5,650	2,113	2/	1,917	2,370	1,394	169	2/	2/	6,195
REGION 6: AR,LA,OK,TX	13	2/	2/	2/	2,352	2,050	2/	1,062	297	---	1,838	1,102	2/	1,096	766	188	76	---	308	2,434
REGION 7: IA,KS,MO,NE	12	1,050	211	---	1,261	1,285	2/	467	2/	---	712	---	---	507	317	2/	70	2/	50	1,177
REGIONS 8, 9, 10: AZ,CA,CO,ND,OR,SD,WA	22	1,917	2/	2/	2,147	1,526	111	993	364	---	1,548	672	2/	577	692	570	81	---	8	1,929
U.S. TOTAL	96	16,325	381	330	17,036	15,575	606	8,651	2,313	2/	14,553	5,947	376	6,328	5,841	3,228	660	111	741	16,909
	PERCENTAGE DISTRIBUTION																			
	PERCENT																			
REGIONS 1, 2, 3	10	2/	2/	---	9	10	24	9	2/	---	12	17	2/	12	13	2/	9	2/	2/	11
REGION 4	17	2/	---	2/	21	22	2/	22	19	2/	21	18	---	24	16	15	31	2/	2/	19
REGION 5	23	2/	2/	---	36	37	41	40	38	2/	39	35	2/	30	40	39	26	2/	2/	37
REGION 6	14	2/	2/	2/	14	13	2/	12	13	---	13	19	2/	17	13	16	11	---	42	14
REGION 7	13	6	55	---	7	8	2/	5	2/	---	5	---	---	8	6	2/	11	2/	7	7
REGIONS 8, 9, 10	23	12	2/	2/	13	10	18	11	16	---	10	11	2/	9	12	16	12	---	1	12
U.S. TOTAL	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

1/ DATA COMPILED FROM SPECIAL USDA SURVEY CONDUCTED IN MID-1975. MAXIMUM CAPACITY INCLUDES ALL REPORTED EXPANSIONS THROUGH DECEMBER 1975.
2/ WITHHELD TO AVOID DISCLOSURE OF INDIVIDUAL COMPANIES' OPERATIONS.

TABLE 17.--U.S. PRODUCTION OF REFINED EDIBLE FATS AND OILS, BY REGIONS, OCTOBER 1973-SEPTEMBER 1974 1/

REGION	REFINERIES REPORTING	REFINING: ALKALI	REFINING: STEAM	REFINING: MISCELLA	REFINING: TOTAL	FURTHER PROCESSING: BLEACHING	FURTHER PROCESSING: REARRANGEMENT	FURTHER PROCESSING: HYDROGENATION	FURTHER PROCESSING: FRACTIONATION WINTERIZING	FURTHER PROCESSING: FAT OTHER	FURTHER PROCESSING: DEODORIZING	FURTHER PROCESSING: PLASTICIZING	FURTHER PROCESSING: OTHER	REFINERY PRODUCTS: SALAD AND COOKING OILS	REFINERY PRODUCTS: BAKING AND FRYING FATS	REFINERY PRODUCTS: MARGARINE OIL	REFINERY PRODUCTS: SOAP STOCK	REFINERY PRODUCTS: NONFOOTS	REFINERY PRODUCTS: FOOD INDUSTRIAL	REFINERY PRODUCTS: OTHER	REFINERY PRODUCTS: TOTAL
	NUMBERS	MILLION POUNDS																			
REGIONS 1, 2, 3: NJ,NY,RI,PA,MD,VA	11	2/	2/	---	921	778	61	2/	2/	---	2/	361	2/	444	2/	2/	27	2/	2/	998
REGION 4: AL,GA,KY,MS,NC,SC,TN	16	2/	---	2/	2,176	2,147	2/	1,268	349	---	1,984	273	---	907	771	405	166	2/	2/	2,258
REGION 5: IL,IN,MI,MN,OH	22	2/	2/	---	3,833	3,922	53	2,393	699	2/	3,750	912	2/	1,467	1,500	807	119	2/	2/	4,088
REGION 6: AR,LA,OK,TX	13	2/	2/	2/	1,435	1,124	2/	709	216	---	1,250	369	2/	505	538	220	59	---	161	1,483
REGION 7: IA,KS,MO,NE	12	571	120	---	691	601	---	2/	2/	---	2/	---	---	337	2/	2/	41	2/	50	647
REGIONS 8, 9, 10: AZ,CA,CO,ND,OR,SD,WA	22	1,102	2/	2/	1,224	1,047	11	621	315	---	1,036	172	---	434	313	219	47	---	7	1,019
U.S. TOTAL	96	9,894	204	182	10,280	9,619	183	5,638	1,769	2/	9,322	2,087	68	4,093	3,618	1,864	458	22	438	10,493
	PERCENTAGE DISTRIBUTION																			
	PERCENT																			
REGIONS 1, 2, 3	10	2/	2/	---	9	8	33	2/	2/	---	2/	17	2/	11	2/	2/	6	2/	2/	10
REGION 4	17	2/	---	2/	21	22	2/	22	20	---	21	13	---	22	21	22	36	2/	2/	21
REGION 5	23	2/	2/	---	37	41	29	42	40	2/	40	44	2/	36	41	43	26	2/	2/	39
REGION 6	14	2/	2/	2/	14	12	2/	13	12	---	13	18	2/	12	15	12	13	---	37	14
REGION 7	13	6	59	---	7	6	---	2/	2/	---	2/	---	---	8	2/	2/	9	2/	11	6
REGIONS 8, 9, 10	23	11	13	2/	12	11	6	11	18	---	11	9	---	11	8	12	10	---	1	10
U.S. TOTAL	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

1/ DATA COMPILED FROM SPECIAL USDA SURVEY CONDUCTED IN MID-1975. 2/ WITHHELD TO AVOID DISCLUSURE OF INDIVIDUAL COMPANIES' OPERATIONS.

Nation's potential capacity to 2.7 billion pounds. The sharpest expansion will occur in deodorizing capacity, as seven refineries show a 1.5 billion pound or 10 percent prospective increase. This will boost total U.S. deodorization capacity to 16.0 billion pounds (table 14).

New production capacity under construction for refinery products totals 1.4 billion pounds, with eight plants involved. This represents an increase of 8 percent over the 16.9 billion pounds as of December 31, 1975. Most of this new capacity will be used to produce baking and frying fats, salad and cooking oils, and margarine oil.

Refineries Concentrated in Oil Producing Areas and Metro Centers

The survey data have been summarized both nationally and regionally insofar as possible. The United States was divided into the ten standard federal administrative regions used by the government. In some cases it was necessary to combine regions in order to avoid disclosure of individual company operations.

The 97 edible fats and oils refineries are in 31 States. They tend to be clustered in soybean and cottonseed production areas and in large metropolitan consuming centers. Soybean and cottonseed oils account for a large proportion of all the edible vegetable oils once-refined.

About three-fifths of the refineries are concentrated in seven States as follows: California, 13 plants; Illinois, 12 plants; Texas, 9 plants; Iowa, 7 plants; New Jersey, 7 plants; Ohio, 5 plants; and Tennessee, 5 plants.

Major Production in Mid-America

U.S. production of refined edible fats and oils (alkali, steam, and miscella) totaled 10.3 billion pounds during the 1973/74 marketing year. Maximum annual production capacity as of December 31, 1975, was 17.0 billion pounds, indicating the refining industry operated at about 60 percent of its potential capacity. This represents about a 34-percent increase over the 12.7 billion pounds refining capacity reported in the 1967 special USDA survey. These data are summarized in tables 16 and 17 by regions.

Region 5 ranked first in maximum annual refinery capacity, reporting 6.1 billion pounds or 36 percent of the total—Illinois is the leading soybean State, partly explaining the heavy concentration of refining facilities in this region. The refining industry is largely dependent upon the crude oil output of oilseed crushers, since vegetable oils constitute the major portion of domestically-produced edible fats and oils. Region 4 ranked second, followed by Region 6.

Before refined vegetable oils are used in finished products, they generally undergo secondary processing. The survey shows that edible oils go through an average of three stages of further processing (intermediate processes beyond alkali refining), and that most refineries have some packing facilities for finished products other than bulk. About two-thirds of the refineries performed a complete refining process. The extent of further refining of edible oils largely depends upon markets supplied and the end-products manufactured.

Refiners Packing Facilities

Among the 97 plants responding, 55 had some facilities for packing products (other than bulk) at the refinery location. The others shipped in bulk the processed oil or fat to other plants for product manufacture and packaging. The total pack of edible fats and oils in all kinds of containers (including bulk) was 11.5 billion pounds during 1973/74, whereas packing capacity exceeded 16 billion pounds.

The liquid shortening pack was 2.0 billion pounds—mostly in 1- and 5-gallon containers—which represented about 55 percent of available capacity.

The pack of solids at room temperature was 2.2 billion pounds whereas the optimum practical capacity was 5.4 billion pounds as of December 31, 1975. The solid pack in 1- to 3-pound consumer-sized containers was 1.0 billion pounds and in 50- to 60-pound tins or cubes was also 1.0 billion.

Approximately 7.3 billion pounds of food fats and oils were shipped in bulk during 1973/74, three-fourths of which were fully refined and deodorized oils. Refiners were not specifically asked to provide capacity estimates for bulk shipment of products. For analytical purposes, however, the bulk capacity was assumed to at least equal the actual shipments during 1973/74.

Regional data on packing capacity and the 1973/74 pack in various sized containers are shown in tables 18 and 19.

Refiners' Loading and Storage Capacities

The maximum bulk loading capacity per day for edible fats and oils at refining plants totals an estimated 100 million pounds, 70 percent of which is for fully refined and deodorized commodities. In other words, the U.S. refining industry had load out capacity to move the entire 1973/74 output of 10.3 billion pounds in about 100 days. A large percentage of this capacity is in the Midwestern States.

U.S. capacity for bulk storage of edible fats and oils at refinery sites was reported at 2.1 billion pounds (table 20). At the 1973/74 production rates, this would be equivalent to about 2 months' supply. This total is understated because some refiners

TABLE 18.--U.S. OPTIMUM PRACTICAL ANNUAL PACKING CAPACITY AT REFINERIES FOR EDIBLE FATS AND OILS, BY REGIONS, AS OF DECEMBER 31, 1975 1/

REGION	REFINERIES REPORTING	LIQUID SHORTENING PACKED IN: DRUMS	5 GAL. CONTAINERS	10 QT. CONTAINERS	1 GAL. CONTAINERS	5 QT. CONTAINERS	OTHER	TOTAL	OTHER LIQUID OIL	TOTAL LIQUIDS	SOLIDS AT ROOM TEMPERATURE PACKED IN: 350-450 LB DRUMS	110-120 LB CONTAINERS	50-60 LB. CONTAINERS	1-3 LB. CONTAINERS	OTHER	TOTAL	BULK SHIPMENTS	TOTAL LIQUIDS AND SOLIDS
	NUMBER	MILLION POUNDS																
REGIONS 1, 2, 3: NJ,NY,RI,PA,MD,VA	11	127	163	2/	169	2/	2/	570	201	771	165	2/	404	232	2/	974	451	2,196
REGION 4: AL,GA,KY,MS,NC,SC,TN	16	87	432	2/	355	2/	64	1,025	2/	2/	15	2/	298	143	2/	2/	1,648	3,376
REGION 5: IL,IN,MI,MN,OH	22	84	104	2/	187	2/	264	729	237	966	273	2/	932	633	2/	2,128	2,650	5,744
REGION 6: AR,LA,OK,TX	13	49	40	2/	66	2/	2/	200	2/	2/	2/	116	2/	518	2/	916	988	2,293
REGION 7: IA,KS,MO,NE	12	2/	2/	---	2/	2/	---	2/	---	2/	2/	2/	2/	---	---	2/	654	694
REGIONS 8, 9, 10: AZ,CA,CO,ND,OR,SD,WA	21	2/	2/	2/	2/	---	2/	2/	2/	274	102	113	250	306	45	815	900	1,989
U.S. TOTAL	95	374	764	67	796	164	495	2,659	990	3,650	566	625	2,122	1,832	206	5,351	7,291	16,292
	PERCENTAGE DISTRIBUTION																	
	PERCENT																	
REGIONS 1, 2, 3	11	34	21	2/	21	2/	2/	21	20	21	29	2/	19	12	2/	18	6	14
REGION 4	17	23	56	2/	45	2/	13	39	2/	2/	3	2/	14	8	2/	2/	23	21
REGION 5	23	23	14	2/	24	2/	53	27	24	26	48	2/	44	35	2/	40	36	35
REGION 6	14	13	5	2/	8	2/	2/	8	2/	2/	2/	19	2/	28	2/	17	14	14
REGION 7	13	2/	2/	---	2/	2/	---	2/	---	2/	2/	2/	2/	---	---	2/	9	4
REGIONS 8, 9, 10 U.S. TOTAL	22	2/	2/	2/	2/	---	2/	2/	2/	7	18	18	12	17	22	15	12	12
	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

1/ DATA COMPILED FROM SPECIAL USDA SURVEY CONDUCTED IN MID-1975. MAXIMUM CAPACITY INCLUDES ALL REPORTED EXPANSIONS THROUGH DECEMBER 1975.
2/ WITHHELD TO AVOID DISCLOSURE OF INDIVIDUAL COMPANIES' OPERATIONS.

TABLE 19.—EDIBLE FATS AND OILS PACKED AT REFINERIES IN THE UNITED STATES, BY REGIONS, OCTOBER 1973-SEPTEMBER 1974 1/

REGION	REFINERIES REPORTING	LIQUID SHORTENING PACKED IN: DRUMS	5 GAL. CONTAINERS	10 QT. CONTAINERS	1 GAL. CONTAINERS	5 QT. CONTAINERS	OTHER	TOTAL	OTHER LIQUID OIL	TOTAL LIQUIDS	SOLIDS AT ROOM TEMPERATURE PACKED IN: 350-450 LB DRUMS	110-120 LB CONTAINERS	50-60 LB. CONTAINERS	1-3 LB. CONTAINERS	OTHER	TOTAL	BULK SHIPMENTS	TOTAL LIQUIDS AND SOLIDS
	NUMBER	MILLION POUNDS																
REGIONS 1, 2, 3: NJ,NY,RI,PA,MD,VA	11	6	24	2/	12	2/	22	92	153	245	6	2/	86	124	2/	219	451	915
REGION 4: AL,GA,KY,MS,NC,SC,TN	16	22	353	2/	249	2/	11	720	171	891	13	6	211	96	5	331	1,648	2,870
REGION 5: IL,IN,MI,MN,OH	22	18	26	2/	54	2/	164	320	208	528	22	2/	420	427	2/	900	2,650	4,079
REGION 6: AR,LA,OK,TX	13	2/	8	2/	4	2/	2/	67	120	187	2/	60	117	256	2/	491	988	1,666
REGION 7: IA,KS,MO,NE	12	2/	---	---	---	---	---	2/	---	2/	2/	2/	2/	---	---	2/	654	683
REGIONS 8, 9, 10: AZ,CA,CO,ND,OR,SD,WA	21	3	8	2/	4	---	2/	2/	108	2/	8	5	2/	138	2/	2/	900	1,310
U.S. TOTAL	95	52	419	44	323	130	274	1,242	760	2,002	59	79	955	1,041	96	2,230	7,291	11,523
	PERCENTAGE DISTRIBUTION																	
	PERCENT																	
REGIONS 1, 2, 3	11	12	6	2/	4	2/	8	7	21	12	9	2/	9	12	2/	10	6	8
REGION 4	17	42	84	2/	77	2/	4	58	22	45	22	8	22	9	5	15	23	25
REGION 5	23	35	6	2/	17	2/	60	26	27	26	36	2/	44	41	2/	40	36	35
REGION 6	14	2/	2	2/	1	2/	2/	5	16	9	2/	76	12	25	2/	22	14	15
REGION 7	13	2/	---	---	---	---	---	2/	---	2/	2/	2/	2/	---	---	2/	9	6
REGIONS 8, 9, 10 U.S. TOTAL	22	5	2	2/	1	---	2/	2/	14	2/	14	7	2/	13	2/	2/	12	11
	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

1/ DATA COMPILED FROM SPECIAL USDA SURVEY CONDUCTED IN MID-1975. 2/ WITHHELD TO AVOID DISCLOSURE OF INDIVIDUAL COMPANIES' OPERATIONS.

TABLE 20.--U.S. REFINERY BULK SHIPMENTS OF EDIBLE FATS AND OILS, BY REGIONS, 1973/74, AND MAXIMUM BULK STORAGE CAPACITY AT PLANT 1/

REGION	REFINERIES REPORTING	QUANTITY SHIPPED DURING OCTOBER 1973-SEPTEMBER 1974				MAXIMUM BULK STORAGE CAPACITY AT PLANT, 1975
		ONCE REFINED (ALKALI OR STEAM)	FULLY REFINED AND DEODORIZED	OTHER	TOTAL	
	NUMBER	MILLION POUNDS				
REGIONS 1, 2, 3: NJ,NY,RI,PA, MD,VA	11	2/	407	2/	451	287
REGION 4: AL,GA,KY,MS, NC,SC,TN	16	203	1,338	107	1,648	441
REGION 5: IL,IN,MI,MN,OH	22	221	2,063	366	2,650	617
REGION 6: AR,LA,OK,TX	13	414	499	75	988	366
REGION 7: IA,KS,MO,NE	12	2/	464	2/	654	68
REGIONS 8, 9, 10: AZ,CA,CO,ND, OR, SD,WA	21	271	572	57	900	298
U.S. TOTAL	95	1,275	5,343	673	7,291	3/2,077
	PERCENTAGE DISTRIBUTION					
	-PERCENT-					
REGIONS 1, 2, 3	11	2/	8	2/	6	14
REGION 4	17	16	25	16	23	21
REGION 5	23	17	39	54	36	30
REGION 6	14	32	9	11	14	18
REGION 7	13	2/	9	2/	9	3
REGIONS 8, 9, 10	22	21	10	9	12	14
U.S. TOTAL	100	100	100	100	100	100

1/ DATA COMPILED FROM SPECIAL USDA SURVEY CONDUCTED IN MID-1975.
2/ WITHHELD TO AVOID DISCLOSURE OF INDIVIDUAL COMPANIES' OPERATIONS.
3/ THIS FIGURE IS UNDERSTATED BECAUSE SOME REFINERS (12) DID NOT REPORT THEIR STORAGE CAPACITY FOR BULK FATS AND OILS.

TABLE 21.--U.S. EDIBLE FATS AND OILS REFINING CAPACITIES AND PRODUCTION, 1975 AND 1967 1/

ITEM	MAXIMUM ANNUAL PRODUCTION CAPACITY			PRODUCTION			PROPORTION OF MAXIMUM CAPACITY UTILIZATION	
	TOTAL			OCTOBER-SEPTEMBER				
	1975	1967	1975 AS PERCENT OF 1967	1973/74	1966/67	1973/74 AS PERCENT OF 1966/67	1973/74	1966/67
	--MILLION POUNDS--		PERCENT	--MILLION POUNDS--		- - - - -PERCENT- - - -		
REFINING:								
ALKALI	16,325	12,346	132	9,894	7,857	126	61	64
STEAM	381	360	106	204	273	75	54	76
MISCELLA	330	N.A.	N.A.	182	N.A.	N.A.	55	N.A.
TOTAL	17,036	12,706	134	10,280	8,130	126	60	64
FURTHER PROCESSING:								
BLEACHING	15,575	13,037	119	9,619	8,590	112	62	66
REARRANGEMENT	606	441	137	183	162	113	30	37
HYDROGENATION	8,651	6,223	139	5,638	4,432	127	65	71
WINTERIZING	2,313	1,602	144	1,769	1,119	158	76	70
DEODORIZING	14,553	10,929	133	9,322	8,345	112	64	76
PLASTICIZING	5,947	4,899	121	2,087	2,005	104	35	41
OTHER	376	288	131	68	136	50	18	47
REFINERY PRODUCTS:								
SALAD AND COOKING OILS	6,328	3,608	175	4,093	2,911	141	65	81
BAKING AND FRYING FATS	5,841	5,362	109	3,618	3,132	116	62	58
MARGARINE OIL	3,228	2/2,984	108	1,864	2/1,949	96	58	65
SOAP STOCK/FOOTS	660	N.A.	N.A.	458	N.A.	N.A.	69	N.A.
NONFOOD INDUSTRIAL	111	N.A.	N.A.	22	N.A.	N.A.	20	N.A.
OTHER	741	733	101	438	581	75	59	79
TOTAL	16,909	12,686	133	10,493	8,572	122	62	68
PACKING:								
LIQUIDS--								
DRUMS				52	114	46		
5-GALLON CONTAINERS				419	96	437		
10-QUART CONTAINERS				44	N.A.	N.A.		
1-GALLON CONTAINERS				323	307	105		
5-QUART CONTAINERS				130	N.A.	N.A.		
OTHER				274	425	64		
OTHER LIQUID OIL				760	N.A.	N.A.		
TOTAL LIQUIDS				2,002	942	212		
SOLIDS--								
340-450-POUND DRUMS				59	240	25		
110-120-POUND CONTAINERS				79	122	65		
50-60-POUND TINS OR CUBES				955	942	101		
8-49-POUND CONTAINERS				N.A.	64	N.A.		
ALL UNDER 8 POUNDS				N.A.	1,158	N.A.		
1-3 LB. CONTAINERS				1,041	N.A.	N.A.		
OTHER				96	N.A.	N.A.		
TOTAL SOLIDS				2,230	2,526	88		
BULK SHIPMENTS				7,291	5,142	142		
TOTAL LIQUIDS AND SOLIDS	3/			11,523	8,611	134		

1/ DATA COMPILED FROM SPECIAL USDA SURVEYS OF EDIBLE FATS AND OILS REFINERS. NINETY-SEVEN REFINERS REPORTED IN THE 1975 SURVEY COMPARED WITH 83 IN 1967. 2/ INCLUDES MARGARINE. 3/ NOT INCLUDED IN SURVEY. N.A.--NOT AVAILABLE.

(12) did not report their storage capacity for bulk fats and oils.

Year-Round Operation

The typical production schedule for the refining industry in 1973/74 was an average 49 weeks per year, 6 days per week, 3 shifts per day, and 8 hours per shift. The average work pattern for packing operations was around 50½ weeks per year, 5 days per week, 1 to 2 shifts per day, and 8 hours per shift.

To achieve optimum practical capacity, refiners anticipated that the schedule would be stepped up to 51 weeks per year. The production and packing schedules would be affected, of course, by certain limiting factors.

Production Limitations

Refiners were asked to rank the three most important factors limiting the attainment of optimum practical output or packing.

The most important factors cited were natural gas and crude oil availability, sales demand, and deodorizing and hydrogenation capacities. Other limiting factors were downtime due to delays in getting parts and making necessary repairs, limits on availability of fuel oil, and EPA effluent guidelines for wastewater.

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1975 Speeches and Articles Available Pertaining To Fats and Oils

A copy of the following releases may be obtained from the ERS Division of Information, Room 0054 South Building, U.S. Department of Agriculture, Washington, D.C. 20250.

"Decisionmaking In the Oilseed Processing Industry", by Harry O. Doty, Jr. Paper presented at the 21st Annual Conference of Cooperative Soybean and Cottonseed Oil Mills, at the Frontier Hotel, Las Vegas, Nevada, March 10, 1975.

The following 3 papers were presented at the First World Soybean Research Conference at the University of Illinois, Urbana-Champaign, Illinois, August 4-8, 1975:

"Intercountry Competition In the Production and Export of Soybeans", by Alan S. Walter. ERS-610.

"Trends and Patterns In Soybean Oil Use For Food and Industrial Products", by George W. Kromer. ERS-611.

"Substituting Soy Protein For Other Proteins In Feed Rations: Economic Aspects", Paul D. Velde and Charles E. Overton. ERS-612.

"Views On The 1975/76 Sunflowerseed Situation in The Soviet Union" by George W. Kromer. Reprint from Fats and Oils Situation, FOS-280, October 1975, ERS-617.

Outlook for Oilsseds, Fats and Oils" by George W. Kromer. Speech at the National Agricultural Outlook Conference, Washington, D.C., November 19, 1975.

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